

for obtaining temperature and precipitation records for looking at long-term climatic variability.

B. N. Goswami, IISc, spoke on 'The Himalayan mountains and predictability of the Indian summer monsoon'. He showed the importance of various forcing factors in modelling the Indian SW monsoon. Predicting the monsoons has proved difficult due to 'internal' low frequency oscillations in the atmospheric general circulation model. Goswami has investigated the factors responsible for these oscillations using a theoretical model. According to Goswami, 'the interaction of the monsoon subseasonal variations, i.e. intraseasonal oscillations with a timescale of 10–70 days leads to the "internal" low-frequency variability of the monsoon'.

S. Krishnaswami, Physical Research Laboratory, Ahmedabad, in his talk 'Contemporary silicate weathering ratios in the Himalaya: Impact on carbon-dioxide consumption' elaborated on chemical weathering, especially silicate weathering in the Himalaya to understand its linkage with tectonics and climate. He has also looked at the silicate and carbonate weathering effect on carbon-dioxide budgets. Krishnaswami has carried out chemical and isotopic studies of the source waters of the rivers Ganga,

Ghaghara and Indus. Krishnaswami found the headwaters of the Ganga and the Yamuna to have a wide range of dissolved solids with a concentration of about 30–600 mg/l, comprising mainly, of alkaline calcium and magnesium. The major contributors of cations in the river waters are the carbonates, with silicates making up 25% of cations on molar basis. Gypsum and pyrite weathering also contributes towards the cations found. A comparison of silicate and carbonate weathering rates indicates that the former is lower and depends on temperature and erosion. The carbon-dioxide consumption by silicate weathering in the headwaters of the Ganga and its tributaries when compared with other major global river systems, was found to be 0.5–0.8% of the global value. Krishnaswami said that 'this supports the idea that young and high mountains consume carbon dioxide by silicate weathering in excess of the global average'. A look at the high strontium isotope ratios of the Ganga and Yamuna headwaters indicates silicate weathering, according to Krishnaswami.

A highlight of this meeting was the launch of the 'Academy Digital Journal Archive' by K. Kasturirangan. The paper by C. V. Raman published in *Current Science* titled 'The origin of colours of

plumage birds' was projected in its original form. All eleven journals of the Academy are now freely available on the Web. The initiative for this project was taken by N. Balakrishnan, IISc, who is also the Secretary of the Academy. With the Academy going digital, there is a 'legacy of information and individual styles of presentation to be preserved from the best of Indian science', said Balakrishnan.

At the invited teachers' meeting, integral to Science Education Panel activities, concerns were expressed that there was no provision for 'leave' from parent organizations, e.g. universities and colleges, for attending refresher courses organized by the Academy. Another concern was that biotechnology in a few States lacked experimental facilities and trained teachers. A few teachers having gained from carrying out summer projects in institutions, now looked forward for a scheme 'for identifying teachers with research potential' to access funding. Teachers also hoped for an increased 'contact' with local Fellows.

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MEETING REPORT

Neem for the industry or for the common man: Where does India stand?*

The multitudinal backlash of synthetic insecticides and the need for ecologically safe pest-control alternatives for agriculture have led pest-control experts to revert to and intensively explore plants as sources of pesticides. Neem leads the list of plants with the highest potential for this purpose. Worldwide attention and a realization of the long-term benefits that neem promises, both in agriculture and in health care, have resulted in a surge of

commercial interest. It is also being realized that neem has much wider applications than just in pest control or health care. The potential for industrial applications has, in part, triggered feverish research and our understanding of neem chemistry has nearly reached V_{max} . Biologists, on the other hand, seem to have taken a more measured and slower approach towards unmasking the biological effects of neem and its derivatives. If and when the insights gained by chemists and biologists converge, what bounties will neem yield for mankind? This precisely was the focus of the Fourth World Neem Conference 2002 held at Mumbai.

As many as 350 delegates, including 50 from abroad, debated a wide gamut of issues regarding neem, neem industry, benefits to common man, conservation of neem and the future of neem in India. Fourteen invited and 141 contributed papers were presented in 16 technical sessions. Not surprisingly, the role of neem in insect control dominated the conference with 25 papers. Other issues covered were environment and socio-economic issues (9), animal and human health (12), chemistry (9), nematode control (3), fungus control (4), processing and product development (14), genetic improvement and afforestation (8), and miscellaneous topics (6).

*A report on 'Neem 2002: World Neem Conference' held at the Taj Lands End, Mumbai from 27 to 30 November 2002 and organized by Neem Foundation, Mumbai.

The plenary talks at the conference brought out the multifaceted uses of neem and our current understanding of neem and its derivatives. P. Pushpangadan (Director, NBRI, Lucknow), who delivered the keynote address, dwelt at length on the role of neem in our day-to-day life and in our traditions. The Sanskrit name, *Nimba*, meaning to bestow health, suggests the many therapeutic values of the tree and its various parts. Over 700 herbal preparations based on neem are found in Ayurveda, Siddha, Unani, Amchi and other local health traditions. He pointed out that over 160 local practices are known in different parts of the country where neem forms an important or sole ingredient in curing human ailments or disorders. Citing many references to neem in ancient literature, he stressed the need for continuing this tradition with scientific validation of specific health care and other utilities. However, during the course of his talk, he also raised the contentious issue of origin of neem, referring to its possibility of African origin and its later movement outside Africa through human activities. This was later refuted by several speakers with suggestions that enormous Indian traditional practices involving neem were known since the time of Mohenjodaro and Harappa. However, emotional views apart, rigorous scientific evidence may be necessary to settle this contentious issue. A consideration of evolutionary trends in Meliaceae of Africa and the Indian subcontinent could possibly help solve the issue unequivocally.

One name that has almost become synonymous with neem is that of H. Schmutterer (Institute of Phytopathology and Applied Zoology, University of Giessen, Germany) whose research on neem spans nearly fifty years. A number of research teams from Germany, led by Schmutterer have contributed immensely to understand and develop neem as a potent alternative to synthetic pesticides in the field of agriculture. Their contribution is perhaps the most primary input for today's enormous interest in neem research. Multifarious biological effects on a variety of insects of economic importance and the possibility of developing home-made insecticides using neem were important contributions from the team. The study of structure-activity relationships of a number of limonoids and meliacins, found not just in neem but also in many other Meliaceae, has improved our un-

derstanding of the biological activity of neem in pest management. Schmutterer spoke in detail about the contribution of these teams over the last three decades in the development of neem as a potent pesticide in the years to come.

S. R. Venugopal (FRLHT, Bangalore) traced the history of neem in Indian health traditions. His talk gave a detailed glimpse into the role of neem in our history sketched by Sanskrit and Tamil writers.

Research into multiple actions of neem and its field utility is the hallmark of R. C. Saxena's lifetime work in different international institutes. His speech highlighted the social and economic implications of neem as a home-made pesticide. Besides demonstrating the advantages of using neem in its various forms for the management of pests of many agricultural crops, he warned Indians to be wary of competition from other countries, especially China, with respect to development of neem. He suggested that the farming community focus on incorporating neem as an important ingredient in farming practices to go the world way – the organic way. He also raised the issue of strategies to be adopted by the Government of India to tackle the GATT agreement that would put pressure on the quality of export commodities. Sensitizing the farming community to these needs would go a long way in improving our own standards of agricultural products and uses of neem, – international laws notwithstanding. Saxena called for concerted efforts towards this end. More prominently, empowerment of the poor among the farming community is perhaps best done through propagating neem. Being the chairman of the Neem Foundation, he has rightly taken up the responsibility of greening the country with 80 million trees. His African experience, in promoting neem to empower the poor farmers, should come in handy for his Indian venture.

V. Mojumder (IARI, New Delhi) spoke on the utility of neem in the management of nematodes, another class of pests that attack agricultural crops. Use of neem cake and mulching with neem leaf were suggested, the twin advantages, of them acting as both pest-control agents and soil ameliorants. Mojumder also highlighted various improved methods of application of neem and neem products to control plant parasitic nematodes.

The role of small-scale industries in harnessing the potential of neem was explained by S. R. Singh (Ministry of Small-Scale Industries, New Delhi). He discussed a detailed assessment of the small-scale industrial plants to process neem and their cost-benefit factors. During the course of his talk he also provided some interesting data on neem trees (16.6 million) in the country, seed availability (6,64,000 MT), estimated harvest rate (50%), estimated turnover in the product sector (Rs 1000–1200 crores), besides suggesting the names of Indian states that could contribute towards various product-development activities.

An interesting idea of promoting neem as an 'industrial plant' was put forward by H. M. Behl (NBRI, Lucknow) who also listed the necessary steps to be taken towards this end. Stressing on the need for policy decisions to this effect and the associated benefits, he recognized natural variation as a hurdle for various activities relating to industrialization. Further, he suggested ways and means of combating these problems. In particular, identification of elite clones and the need for developing proper cultivation techniques and promotion of agro-forestry with neem were the main suggestions. Questions on socio-economic impacts of such a policy however went abegging.

Discussing the constraints in the development of the neem industry, S. S. Pillai (EID Parry (India) Ltd, Chennai) identified restrictions imposed by the Fertilizer Control Order affecting the sale of neem-coated urea, disparity in treatment of coated and normal urea for subsidy payment, separation of registration requirements for local and export of pest control formulations, the stress for long-term carcinogenicity data requirement by CIB, the need for excise and sales-tax exemption for green products such as neem, minor seed oil credit for neem-oil business, inadequate focus on government extension systems as the primary constraints for development of neem industries. Further, he suggested the need for quality raw materials and better harnessing of the available neem seeds for processing purposes.

M. G. Gopinathan (EID Parry (India) Ltd, Bangalore) discussed the issues relating to IP rights and neem. During the course of his talk he brought to light the patenting pattern in neem-related products and processes. The decline in number of patents may have several les-

sons for both the industry and the common man. Sixty-three per cent of all patents on neem were related to pesticidal use and several other uses covered included veterinary care, health care, cosmetics and industrial applications. USA dominated the neem patent scene with over 50 patents. Discussing the issue of patenting natural products such as neem, Gopinathan commented that neem was the ultimate winner since both the IP rights of the patent seekers and also the native knowledge are being recognized. However, the need for proper documentation of local traditional uses of neem and such plants is a vital step towards which the government and non-governmental organizations need to take more intensive steps. Some interesting statistics provided by him amply suggested the operation of natural selection among the poor-quality products that would in any case be eliminated in due course of time.

Procedures involved in the development and registration of pesticides and the performance of neem, were presented by H. Kleeberg (Trifolio-M GmbH, Germany). Specific exemptions available in different countries for registering neem and neem products compared to synthetic pesticides were also discussed. S. A. van der Esch (ENEA Neem Task Force, Rome) presented the Italian experience in neem research. Italian work in the recent past amply demonstrated the possible utility of neem in managing pigeons

through fertility control, mosquito control, management of several agricultural and veterinary pests and in human health. He also suggested the need for better understanding of the mode of action of neem against insects.

Development of neem-coated urea and its manifold benefits were discussed by B. N. Vyas (Godrej Agrovet Limited, Mumbai). Urea is the most important and intensively used nitrogen fertilizer in India. After its application to soil, nitrogen is lost quickly due to leaching and volatilization, resulting in less than 30% of the applied nitrogen in the form of urea to be really useful for the plant. Neem-coated urea, however, has been shown to greatly enhance the utility of N applied as urea. He called for farmer education in this direction, to enhance efficiency of both N and P fertilizers.

During the course of the conference, several important issues came to the fore. One of the most important aspects of neem that needs immediate attention is a dedicated database that would document burgeoning information being generated on neem. While this would take care of the needs of researchers, the utility of neem, proper methods of use and the need for its conservation and propagation by local communities call for launching a massive educational programme. The benefits of such a programme would not only lead to farmer empowerment, but also reap rewards for the industry.

As already stated, an estimated 664,000 MT of neem seed is being produced in the country according to S. R. Singh. At a liberal rate of 5% of home-made neem seed kernel extract with five applications per crop using a high volume sprayer, this quantity, if harvested, even at the present rate of 50%, would be sufficient to treat over 1 m ha of agricultural crops for pest management. This would be an estimated saving of nearly 800,000 kg insecticidal compounds (not formulations), at an average expected rate of consumption of 0.75 kg active ingredients per hectare per season. From the industry point of view, this amounts to an estimated over 1600 MT of azadirachtin per annum. That is an enormous amount of raw material for the pesticide industry. Unfortunately, neem is not really cared for either as a home-made insecticide or as an invaluable raw material for the industry. India, therefore, should now take right steps in promoting neem, both for the benefit of the farming community and the country at large, by providing good quality and sufficient raw material for the industry. With these ideas, to watch what is happening in Africa, the next neem conference to be held in 2005, is Africa-bound.

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MEETING REPORT

IOGOOS-I Mauritius 2002: Establishment of a regional alliance*

The Indian Ocean is the third largest ocean in the world with an average water depth of 3840 m and area of 74 million km². The continental shelf and slope together in the Indian Ocean admeasure to 6.73 million km² (one-third of Atlantic and one-fourth of Pacific oceans). Moreover, the Indian Ocean is unique, as un-

like the Atlantic and Pacific oceans, it is blocked by landmass on the northern side and disconnected from the Arctic polar environment.

These physical characteristics give this ocean unique dynamical qualities resulting from vigorous air-sea-land interaction. This is the only ocean where annual reversal of the wind regime occurs. The climate is dominated by the northeast (NE) monsoon (December–April) and the southwest (SW) monsoon (June–October). Tropical cyclones occur during May/June and October/November in the northern Indian Ocean and during November and April in the southern Indian Ocean. The

ocean response to the monsoon regime is also unique. The ocean surface is dominated by a counter-clockwise gyre in the southern Indian Ocean, while a reversal of surface currents in the northern Indian Ocean is generated by the monsoon. While the decadal variation of the Indian Ocean circulation is associated with rain anomalies in many countries in the region, the Antarctic circumpolar wave affects the climate of southern Africa and Australia. All these greatly impact the socio-economic development of the Indian Ocean countries.

Yet the Indian Ocean is the least explored ocean in spite of much effort

*A report on the first IOGOOS meeting held at Mauritius from 4 to 9 November 2002 at the International Conference Centre, Grand Baie, hosted by the Mauritius Oceanography Institute under the aegis of the Intergovernmental Oceanographic Commission (IOC) of UNESCO Regional Office, Perth and supported by several sponsors.